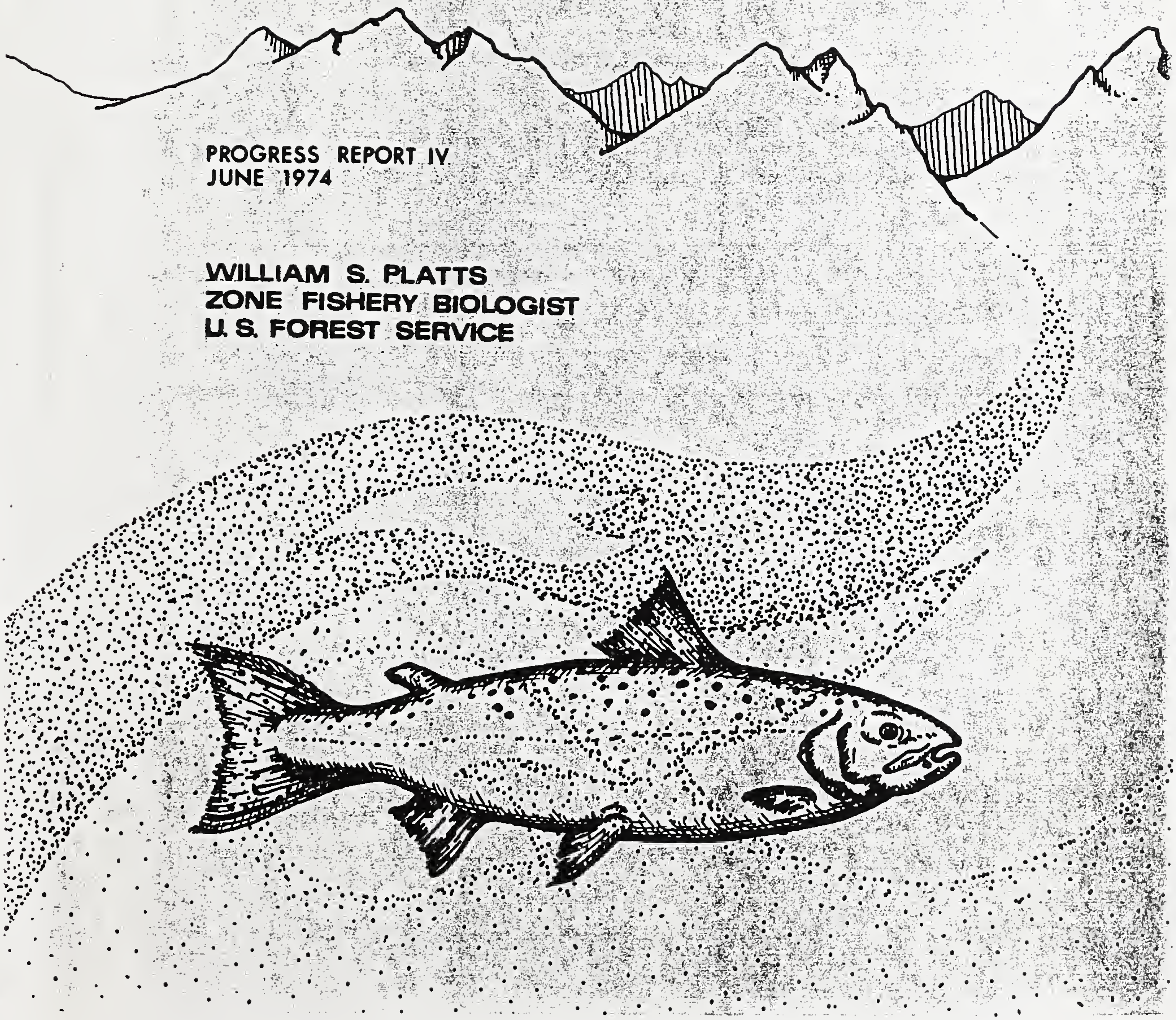
STREAM CHANNEL SEDIMENT CONDITIONS IN THE SOUTH FORK SALMON RIVER, IDAHO



PROGRESS REPORT IV
JUNE 1974

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Progress Report IV
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ABSTRACT

Prior to 1965, the South Fork Salmon River (SFSR) steadily degraded in quality, due to acceleration of incoming fine sediment from disturbed lands. Most of the degradation occurred between 1962 and 1965. Prior to 1952, the drainage was in good aquatic environmental condition.

During 1952-1965, the SFSR was incapable of discharging the accrued bedload sediment as fast as it was being recruited. This period corresponded with the increase in logging and road construction activities. During 1966-1972, the SFSR discharged from its system bedload sediment faster than it was being recruited. During this period, there was decreased logging and road construction, finalizing in a complete non-log moritorium. During 1973, monitoring areas continued to show improvement, but the river stations did not. Factors such as an extremely low waterflow year (1973) resulting in low energy for moving sediment, and pools acting as sediment traps even during fairly high flows could be the reason for the increase of channel fine sediment readings.

In Progress Report II, it was predicted that without any large storms and no additional logging or other conditions causing disturbed lands, along with rehabilitation of the present road system and logged areas, the river should return to near-natural status within the next decade. Even though all the 1973 information does not follow this trend, I believe that the information does not warrant any changes in past predictions of the river's return to near-natural conditions.

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INTRODUCTION

The reader should refer to Progress Reports I, II, and III (Platts 1968, 1972, 1974) for background information on past conditions of the river and its tributaries. Methods and equipment, study area description, past history, hydrochemical profiles, and other information are also contained in these reports and will not be duplicated in this report. The purpose of this report is to demonstrate the relationship of aquatic conditions during 1973 with past findings and how the information influences past predictions of future aquatic conditions. The major purpose of the South Fork Salmon River (SFSR) studies is to determine the condition of the aquatic environment and provide measures needed to maintain or enhance this environment. Reports I (1968) and II (1972) have fulfilled most of this need.

AQUATIC ENVIRONMENT TRENDS

Prior to 1952, the river was in good condition (Croft 1950, Fish Passage Reports 1964-1973). From about 1958 through 1965, the river and some of its tributaries received increased sediment loads, mainly from roads associated with logging operations. Much of the SFSR sediment accruement is due to landslides and slumps which are generally associated with intensive storms, coupled with disturbed lands (Jensen 1965).

Channel Substrate

Monitoring Areas

The location of the spawning monitoring stations are identified in previous reports with general location in Figures 1 and 2. These stations monitor the major chinook salmon spawning areas which are located mainly in low energy riffles that act as gravel sinks. Monitoring stations are not representative of the complete river system and their primary purpose is to monitor the spawning environment.

Fine Sediment

Bedload fines, for this study, are classified as sediment between .20 mm and 4.7 mm in diameter. This bedload material, because of its predominance and characteristics, is the major factor responsible for reducing the condition of SFSR aquatic environment.

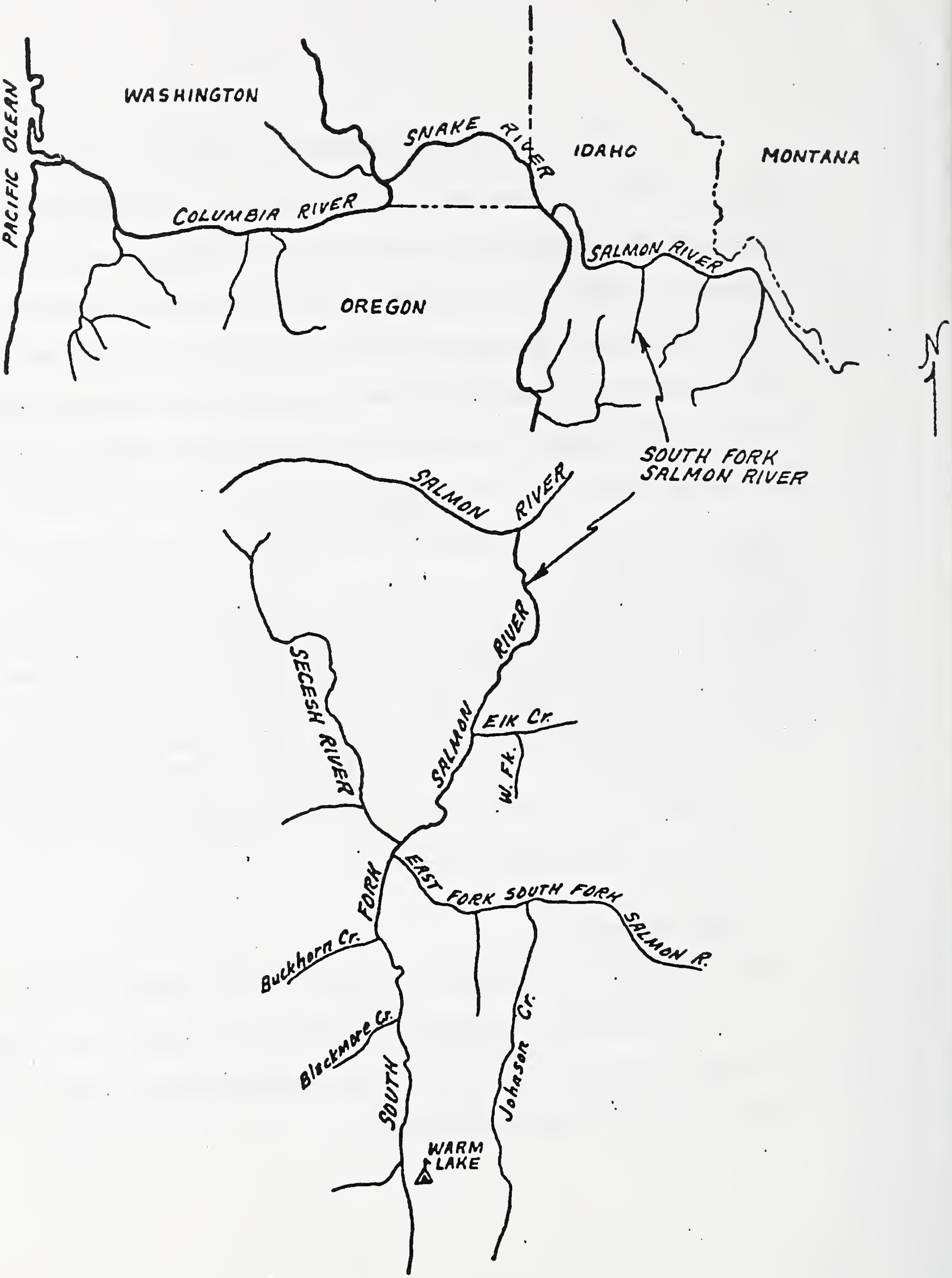

FIGURE 1
A PORTION OF THE COLUMBIA RIVER DRAINAGE WITH THE LOCATION AND FURTHER EXPANSION OF THE SOUTH FORK OF THE SALMON RIVER.

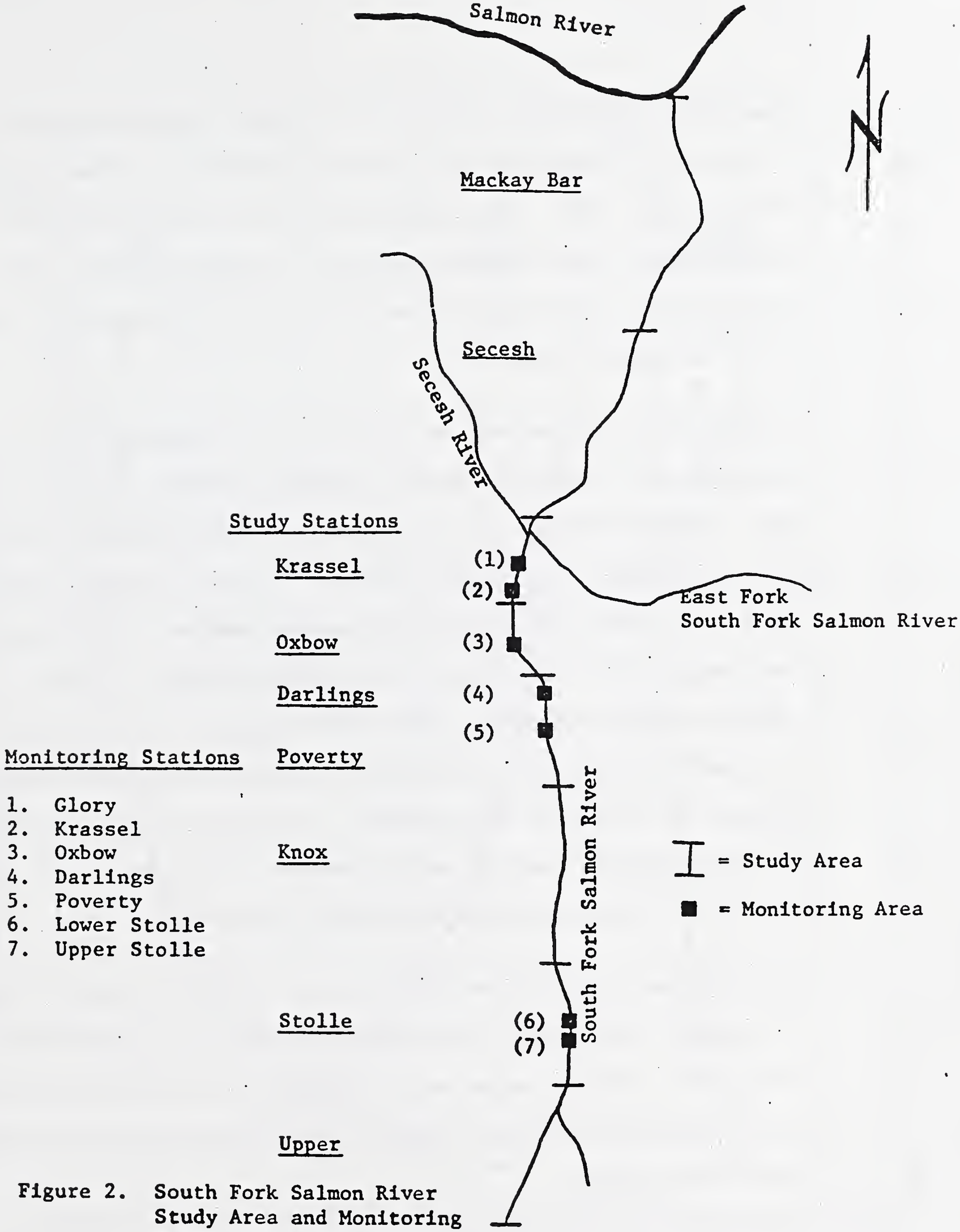

Figure 2. South Fork Salmon River Study Area and Monitoring Station Locations.

From 1968 through 1971, contained fine sediment decreased steadily at a rate of 4.2 percent per year and was expressed in a linear regression (Platts 1968, 1972). This demonstrates that the river is steadily moving toward conditions existing prior to logging activity. The changing river environment reflects the relief of stress on the river as the watershed heals.

In 1965, fine sediment made up 50 percent of all materials in the spawning areas (referring mainly to channel surface). By 1971, surface fine sediment had decreased to 25 percent of the monitoring station materials (Figure 3 and Tables 1 through 4), for a 50 percent reduction. From 1971 to 1973, the average fine sediment content for all spawning areas had dropped another 3 percent. The equation defining the trend in fine sediments is--fine sediment equals $18.00 + \frac{35.72}{t}$. At the present rate, the equation indicates the spawning environments are headed towards an endpoint of 18 percent fine sediment. I believe the true natural value is lower than this, but the large mileage of road system in the drainage may not let the river obtain near-natural conditions.

Percent fines in the Krassel monitoring area, for 1973, were the lowest (6 percent) recorded and in the future may not go any lower (Table 1). During 1973, riffles cleaned well through this area because pools caught and contained fine sediment, possibly because of the extreme low water runoff (low energy).

Figure 3. Curves depicting trends of sediment classes in the SFSR from 1966 to 1973.

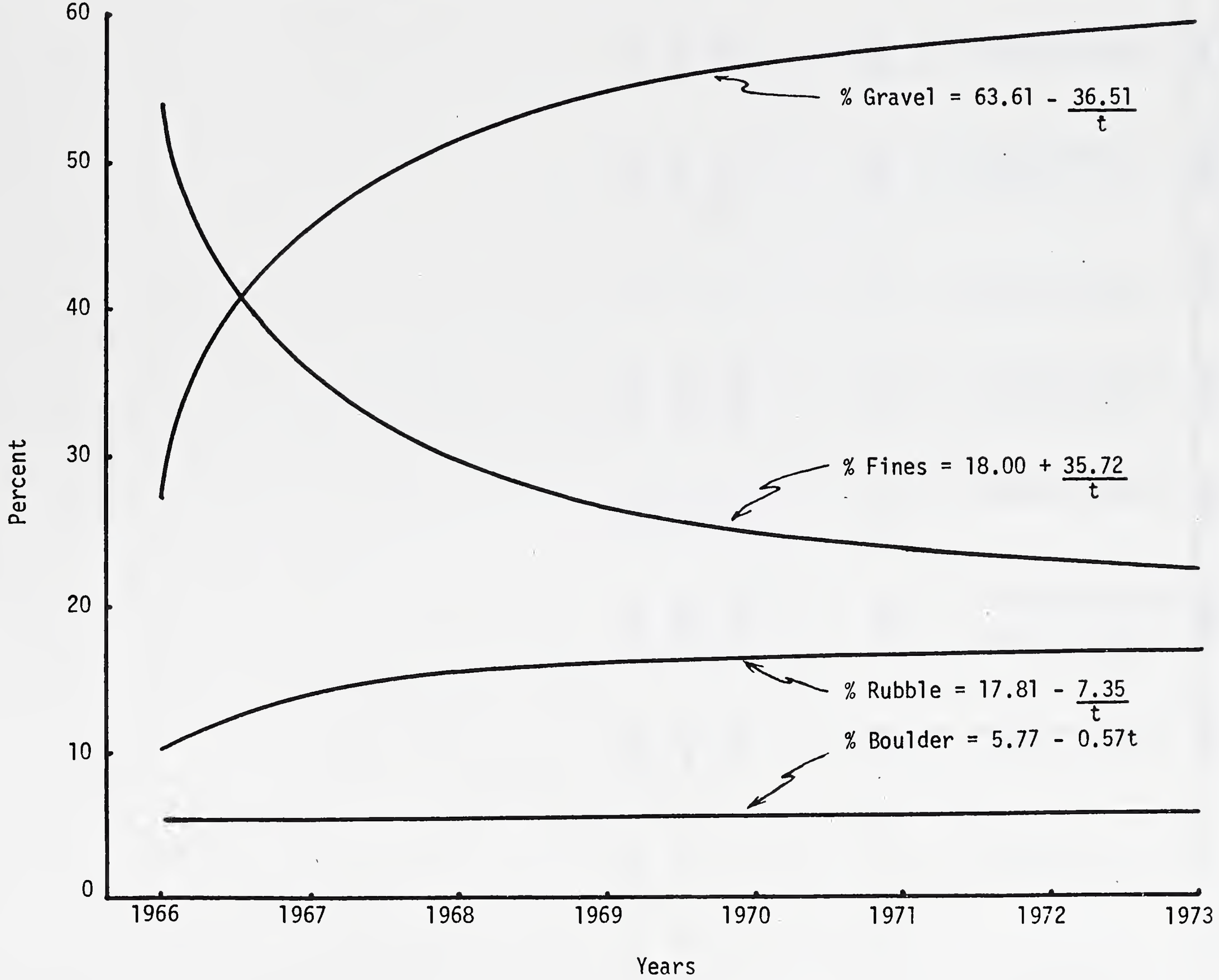

Table 1. Percent fines - Krassel Monitoring Station

	1966	1967	1968	1969	1970	1971	1972	1973
1	22	27	14		18	13	27	3
2	37	28	18		6	20	13	6
3	37	37	23		8	12	22	6
4	35	43	10		21	10	13	9
5	42	44	18		15	14	11	7
6	49	59	15		20	12	25	7
7	64	58	6		52	10	17	7
8	33	77	10		19	13	15	4
n	8	8	8		8	8	8	8
$\bar{x}$	39.9	46.6	14.2		19.9	13.0	17.8	6.13
CI	10.36	14.3	4.56		11.8	2.65	5.04	1.68
Max.	50.3	60.9	18.8		31.7	15.6	22.84	7.81
Min.	29.5	32.3	9.6		8.1	10.4	12.76	4.45

Table 2. Percent fines - Glory Monitoring Station

	1966	1967	1968	1969	1970	1971	1972	1973
1	42	20	7		9	6	3	2
2	46	25	19		18	8	9	17
3	32	29	18		23	5	6	20
4	40	22	8		14	9	15	20
5	56	30	34		17	5	20	23
6	60	47	7		30	11	28	10
7	66	54	19		31	18	22	4
8	66	43	41		17	7	17	6
n	8	8	8		8	8	8	8
$\bar{x}$	51.0	33.5	19.0		19.9	8.4	15.0	12.75
CI	10.69	10.5	10.57		6.39	3.71	7.12	7.33
Max.	61.7	44.0	29.6		26.3	12.1	22.12	20.08
Min.	40.3	23.0	8.4		13.5	4.7	7.88	5.42

Table 3. Percent fines - Stolle Monitoring Station

	1966	1967	1968	1969	1970	1971	1972	197
1		55	64		48	29	20	2
2		51	7		44	50	48	4
3		39	68		35	51	0	1
4		50	32		27	0	3	3
5		73	43		41	3	25	1
6		39	16		47	46	7	2
7		34	26		32	10	68	1
8		58	5		85	8	56	1
9		32	57		51	0	0	
10		36	50		44	59	0	4
11		37	33		73	28	51	1
12		80	19		13	30	55	1
13		21	19		0	21	10	18
14		76	33		25	3	13	40
15		31	9		50	3	0	9
16		8	15		32	30	6	0
17		58	3		36	42	0	26
18		36	11		19	15	7	0
19		82	17		70	31	42	75
20		42	0		30	0	14	
n		20	20		20	20	20	19
$\bar{x}$		46.9	26.35		40.1	22.45	21.25	23.11
CI		9.29	9.65		9.48	9.08	10.76	9.09
Max.		56.2	36.0		49.6	32.0	32.01	32.20
Min.		37.6	16.7		30.6	13.9	10.49	14.02

Table 4. Percent fines - Poverty Monitoring Station

	1966	1967	1968	1969	1970	1971	1972	1973
1			91		100	75	47	10
2			74		66	76	56	30
3			67		72	35	21	32
4		69	14		87	10	16	44
5		55	34		59	2	9	28
6		42	19		71	2	38	8
7		39	44		31	9	25	15
8		39	13		13	12	20	28
9		24			19			
10					31			
11					51			
12					14			
13					15			
14					19			
15					19			
16					39			
17					18			
18					14			
19					7			
20					4			
21					2			
n		6	8		21	8	8	8
$\bar{x}$		44.67	44.5		35.8	27.6	29.9	24.38
CI		16.24	24.9		6.84	26.2	13.65	11.00
Max.		60.9	69.4		42.6	53.8	42.65	35.38
Min.		28.4	19.6		29.0	1.4	15.35	13.38

The Glory monitoring area was also low in fine sediment during 1973 (13 percent), but not as low as in 1971 (8.0 percent) and has dropped considerably from the heavy buildup of fine sediment (51 percent) this spawning area contained in 1966 (Table 2). From 1971 through 1973, the Stolle monitoring area stayed very uniform in fine sediment content in the channel (Table 3). The area now contains about half the fine sediment the channel contained in 1967 and 1970.

The Poverty spawning area is continuing its fine sediment decline for a total reduction of about 50 percent (Table 4). This spawning area should continue to cleanse further.

Gravel

Surface gravels in spawning areas steadily increased from 1965 to 1971; however, gravel decreased during this period in the rest of the river channel. Chinook salmon and steelhead trout spawn in riffle areas low in channel gradient because they are natural gravel traps. The majority of the river channel has high competency that does not allow gravel to remain as part of the streambed. During 1965, surface gravel in spawning areas made up 30 percent of the channel materials. Percent gravel steadily increased annually (4.4 percent) and by 1971 made up over 50 percent of the spawning area materials.

In the Krassel monitoring area, gravel steadily increased from 46 percent in 1966 to 85 percent in 1973 (Table 5). The two large increases were between 1967 and 1968 and 1972 and 1973. During 1973, there was a large elimination of fine sediment which was replaced by gravel and may be attributed to upstream pools acting as fine sediment debris basins.

The Glory station is also steadily increasing in gravel with an increase from 1972 to 1973 (Table 6). Percent channel gravel increased from 29 percent in 1966 to 66 percent in 1973.

The Stolle monitoring area also steadily increased in channel gravel from 36 percent in 1967 to 60 percent in 1973 (Table 8). This area is lower in energy (water caused) than the other spawning areas, but the gravel increase is comparable.

The Poverty spawning area also steadily increased in gravel content with one slight drop in 1972 (Table 7). Gravel content has increased from 19 percent in 1967 to 66 percent in 1973 for an extremely large increase. This change to gravel domination of the channel shows well in the color photographs taken during this period.

Combining all monitoring areas, channel gravel has increased from about 30 percent to 60 percent. The temporal relationship is percent gravel equals $63.61 - \frac{36.51}{t}$. The curve is moving towards 64 percent which I

Table 5. Percent Gravel - Krassel Monitoring Station

	1966	1967	1968	1969	1970	1971	1972	197
1	59	66	80		77	76	56	8
2	48	60	68		84	57	77	8
3	47	48	69		77	78	63	8
4	38	42	78		67	77	81	7
5	36	53	71		80	74	75	8
6	42	39	80		76	74	69	9
7	36	39	82		46	84	71	9
8	63	21	75		74	80	77	9
n	8	8	8		8	8	8	
$\bar{x}$	46.13	46.0	75.38		72.63	75.0	71.1	85.3
CI	8.61	11.78	4.56		9.86	6.67	6.93	6.9
Max.	54.74	57.78	79.94		82.49	81.67	78.03	92.2
Min.	37.52	34.22	70.82		62.77	68.33	64.17	78.4

Table 6. Percent gravel - Glory Monitoring Station.

	1966	1967	1968	1969	1970	1971	1972	1973
1	22	24	27		42	19	28	86
2	32	46	10		58	22	42	75
3	33	33	38		44	35	62	59
4	33	48	33		63	48	69	63
5	38	54	30		63	60	24	63
6	26	37	69		51	58	52	71
7	27	35	47		61	62	58	67
8	24	41	40		75	77	74	45
n	8	8	8		8	8	8	8
$\bar{x}$	29.38	39.75	36.75		57.13	47.63	51.13	66.13
CI	4.56	7.97	14.24		9.18	17.22	15.37	10.74
Max.	33.94	47.72	50.99		66.31	64.31	66.50	76.87
Min.	24.82	31.78	22.51		47.95	30.41	35.76	55.39

Table 7. Percent gravel - Poverty Monitoring Station.

	1966	1967	1968	1969	1970	1971	1972	1973
1			9		0	0	53	90
2			16		34	24	36	64
3			33		28	65	71	62
4		0	86		13	80	42	50
5		27	66		41	98	61	72
6		45	42		29	45	37	53
7		29	49		69	79	65	73
8		13	86		74	88	66	67
9		2			81			
10					51			
11					49			
12					81			
13					60			
14					63			
15					78			
16					57			
17					80			
18					85			
19					80			
20					67			
21					26			
n		6	8		21	8	8	8
$\bar{x}$		19.33	48.38		54.57	59.88	53.88	66.3
CI		18.33	24.52		11.41	28.50	11.66	11.2
Max.		37.66	72.90		65.98	88.38	65.54	77.5
Min.		1.00	23.28		43.16	31.38	42.22	55.1

Table 8. Percent gravel - Stolle Monitoring Station

	1966	1967	1968	1969	1970	1971	1972	1973
1		45	36		42	38	71	75
2		49	93		44	18	52	50
3		42	20		65	27	89	50
4		39	68		43	69	81	62
5		15	19		50	66	54	90
6		36	47		25	11	80	50
7		66	52		68	30	11	74
8		24	0		15	93	22	88
9		39	14		43	55	36	59
10		16	48		48	30	67	10
11		35	36		25	72	49	85
12		20	31		65	70	45	79
13		55	31		100	79	80	69
14		24	67		75	37	78	37
15		39	52		50	56	56	69
16		65	68		42	35	47	45
17		6	87		38	42	51	53
18		49	50		81	79	31	91
19		5	87		30	43	39	10
20		42	87		58	76	45	-
n		20	20		20	20	20	19
$\bar{x}$		35.55	49.65		50.35	51.30	54.20	60.32
CI		8.23	12.58		9.73	10.88	9.92	11.87
Max.		43.78	62.23		60.08	62.18	64.12	72.19
Min.		27.32	37.07		40.62	40.42	44.28	48.45

feel is too high. I have been predicting in past reports that percent gravel will start a decline, but to date the river has proven me wrong. I still feel this curve representing percent gravel will start descending to a lower level. The abnormal high waterflows to be experienced during 1974 could start the decline.

Rubble

Surface rubble in the monitoring areas appeared to increase from 1965 to 1971, but the data did not test significantly (Tables 9 through 12). The chinook salmon spawning areas were composed of 12 percent rubble in 1967 increasing to about 16 percent in 1973. The equation of the relationship is percent rubble equals $\frac{17.81 - 7.35}{t}$.

Boulder

Chinook salmon spawning areas naturally contain very little boulder material because they occur mainly in depositional aquatic types (Tables 13 through 17). The line representing boulder is almost straight; starting out at about 6 percent in 1967 and ending the same in 1973.

Table 9. Percent rubble - Krassel Monitoring Station.

	1966	1967	1968	1969	1970	1971	1972	1973
1	2	3	1		1	5	8	6
2	1	4	15		2	7	8	7
3	1	10	2		8	5	8	8
4	10	9	2		5	5	3	12
5	10	0	5		2	8	9	5
6	5	2	5		2	8	2	0
7	0	2	12		2	6	11	0
8	4	2	10		1	5	8	0
n	8	8	8		8	8	8	8
$\bar{x}$	4.13	4.0	6.5		2.88	6.13	7.0	4.75
CI	3.33	3.0	4.35		2.01	1.14	2.48	3.95
Max.	7.46	7.0	10.85		4.89	7.27	9.48	8.70
Min.	.80	1.0	2.15		0.87	4.99	4.52	0.80

Table 10. Percent rubble - Glory Monitoring Station

	1966	1967	1968	1969	1970	1971	1972	1973
1	21	35	53		34	57	57	7
2	15	17	61		18	63	49	3
3	14	22	34		24	58	31	20
4	16	16	46		21	35	13	9
5	1	13	25		7	28	38	8
6	5	10	17		14	28	17	13
7	3	3	28		7	13	7	23
8	5	7	17		4	14	8	46
n	8	8	8		8	8	8	8
$\bar{x}$	10	15.38	35.13		16.13	37.0	28.75	16.1
CI	6.15	8.3	13.84		8.51	16.7	14.99	12.3
Max.	16.15	23.68	48.97		24.64	53.7	43.74	28.4
Min.	3.85	7.08	21.29		7.62	20.3	13.76	3.7

Table 11. Percent rubble - Stolle Monitoring Station.

	1966	1967	1968	1969	1970	1971	1972	1973
1		0	0		9	29	9	2
2		0	0		12	32	0	4
3		19	13		0	22	7	39
4		11	0		30	26	16	6
5		12	38		9	32	21	0
6		25	34		28	43	13	28
7		0	22		0	60	21	9
8		18	85		0	0	22	0
9		29	29		6	45	64	17
10		40	2		7	11	33	44
11		26	31		0	0	0	0
12		0	50		22	0	0	9
13		24	50		0	0	10	13
14		0	0		0	60	9	23
15		31	39		0	41	44	22
16		20	17		26	35	47	55
17		36	10		27	17	49	21
18		15	39		0	6	62	9
19		13	30		0	26	19	15
20		15	13		12	24	41	-
n		20	20		20	20	20	19
$\bar{x}$		16.7	25.1		9.4	25.45	24.35	16.63
-								
CI		5.84	10.30		5.19	8.83	9.52	7.79
Max.		22.54	35.4		14.59	34.28	33.87	24.42
Min.		10.86	14.8		4.21	16.62	14.83	8.84

Table 12. Percent rubble - Poverty Monitoring Station.

	1966	1967	1968	1969	1970	1971	1972	197
1			0		0	0	0	
2			11		0	0	8	
3			0		0	0	8	
4		24	0		0	10	42	
5		17	0		0	0	30	
6		12	38		0	53	25	3
7		32	7		0	13	8	1
8		32	1		13	0	14	
9		47			0			
10					18			
11					0			
12					5			
13					25			
14					17			
15					3			
16					4			
17					2			
18					1			
19					11			
20					20			
21					63			
n		6	8		21	8	8	8
$\bar{x}$		27.33	7.13		8.67	9.5	16.88	8.
CI		13.14	10.99		6.74	15.35	11.83	11.4
Max.		40.47	18.12		15.41	24.85	28.71	20.2
Min.		14.19	0		1.93	0	5.05	

Table 13. Percent boulder - Krassel Monitoring Station.

	1966	1967	1968	1969	1970	1971	1972	1973
1	17	4	5		5	6	9	9
2	14	8	0		8	15	2	7
3	15	5	6		7	5	7	2
4	14	7	9		8	8	3	5
5	7	3	6		2	4	5	7
6	4	0	0		2	7	3	0
7	0	1	0		0	0	1	0
8	0	0	5		5	2	0	0
n	8	8	8		8	8	8	8
$\bar{x}$	8.88	3.5	3.88		4.63	5.88	3.75	3.75
CI	5.84	2.58	2.88		2.53	3.78	2.55	3.29
Max.	14.72	6.08	6.76		7.16	9.66	6.3	7.04
Min.	3.04	0.92	1.0		2.1	2.1	1.2	0.46

Table 14. Percent boulder - Glory Monitoring Station.

	1966	1967	1968	1969	1970	1971	1972	197
1	15	22	13		15	18	12	5
2	7	13	10		6	8	0	5
3	21	15	9		9	2	1	[illegible]
4	9	15	14		1	8	3	8
5	5	3	11		13	8	18	6
6	9	6	7		6	2	3	6
7	4	8	7		0	8	3	6
8	5	9	1		5	2	1	3
n	8	8	8		8	8	8	8
$\bar{x}$	9.38	11.38	9.0		6.88	7.0	5.13	5.0
CI	4.89	5.08	3.43		4.42	4.47	5.34	1.9
Max.	14.27	16.46	12.43		11.3	11.47	10.47	6.9
Min.	4.49	6.3	5.57		2.46	2.53	0	3.0

Table 15. Boulder - Stolle Monitoring Station.

	1966	1967	1968	1969	1970	1971	1972	1973
1		0	0		0	3	0	0
2		0	0		0	0	0	0
3		0	0		0	0	4	0
4		0	0		0	5	0	0
5		0	0		0	0	0	0
6		0	3		0	0	0	0
7		0	0		0	0	0	0
8		0	10		0	0	0	0
9		0	0		0	0	0	0
10		8	0		0	0	0	0
11		2	0		2	0	0	0
12		0	0		0	0	0	0
13		0	0		0	0	0	0
14		0	0		0	0	0	0
15		0	0		0	0	0	0
16		8	0		0	0	6	0
17		0	0		0	0	0	0
18		0	0		0	0	0	0
19		0	0		0	0	0	0
20		0	0		0	0	0	-
n		20	20		20	20	20	19
$\bar{x}$		0.9	0.65		0.1	0.4	0.5	0
CI		1.15	1.07		0.21	0.59	0.73	0
Max.		2.05	1.72		0.31	0.99	1.23	0
Min.		0	0		0	0	0	0

Table 16. Percent boulder - Poverty Monitoring Station.

	1966	1967	1968	1969	1970	1971	1972	197
1			0		0	25	0	[illegible]
2			0		0	0	0	[illegible]
3			0		0	0	0	[illegible]
4		7	0		0	0	0	[illegible]
5		1	0		0	0	0	[illegible]
6		0	1		0	0	0	[illegible]
7		0	0		0	0	2	[illegible]
8		15	0		0	0	0	[illegible]
9		27			0			
10					0			
11					0			
12					0			
13					0			
14					0			
15					0			
16					0			
17					0			
18					0			
19					2			
20					9			
21					8			
n		6	8		21	8	8	8
$\bar{x}$		8.33	0.13		0.9	3.13	0.25	.38
CI		11.36	0.29		1.17	7.4	0.59	.96
Max.		19.69	0.42		2.07	10.53	0.84	1.34
Min.		0	0		0	0	0	0

Table 17. A summary of annual channel substrate composition in monitoring stations in the South Fork Salmon River (percent).

Year	Boulder	Rubble	Gravel	Fines
1966	9.1	7.1	37.8	45.4
1967	4.5	15.6	36.0	44.0
1968	2.7	20.3	51.8	26.1
1969				
1970	2.0	9.2	56.0	32.8
1971	3.1	21.1	56.5	19.3
1972	1.9	20.7	56.7	20.9
1973	1.7	12.9	67.2	18.3

Complete River Channel

The random stations, set up to describe the complete river system, followed monitoring station information from 1967 through 1972, but 1973 information does not follow this trend (Table 18 and Figure 4). The following reasons may explain this variation.

1. Observation error during 1973.

2. Because of one of the lowest annual river discharge in the past 100 years, energy could have been lacking to move fine sediment from the channel and the annual accrued fine sediment may have caused an increase.

3. Pools in the SFSR filled with fine sediment during 1973 while in past years, having much larger annual water discharge and peak flows, pools continued to cleanse themselves of fine sediment.

4. As the average fine sediment particle size becomes larger and the bulk of the material moves closer to the stratification point (4.7 mm) between fine sediment and gravel, any error in judgment could be magnified.

5. It could be a combination of all five.

Transects will be read again during 1974 to add more reliability to the trend information and determine pool conditions from an extremely high water runoff year. In analyzing transects in the Poverty area, the only area far off from expected measurements, those transects in pool areas read high in fine sediment and most of the random transects in this area did fall in pool areas.

Table 18 . A summary of aquatic habitat survey data for the South Fork Salmon River for 1967, 1971, 1972, and 1973.

Area	Year	Stream					Streambed Surface Composition				
		Width (ft)	Depth (in)	Riffle (ft)	Pool (ft)	Rating	Boulder	Rubble	Gravel (Percent)	Fines	Other
Upper SFSR	1967	19	5	16	3	4	44	22	11	10	13
	1971	18	8	10	8	4	33	29	18	20	0
	1972	19	7	10	9	4	41	31	16	12	0
	1973	16	7	8	8	3	24	42	15	19	0
Stolle	1967	33	11	17	16	3	1	17	49	32	1
	1971	39	11	24	15	3	4	49	15	32	0
	1972	34	9	12	22	3	4	49	26	21	0
	1973	35	9	11	24	2	1	38	28	33	0
Knox	1967	59	13	40	19	3	26	27	19	28	0
	1971	53	14	34	19	3	30	43	8	19	0
	1972	58	13	23	35	3	20	52	12	16	0
	1973	54	12	21	33	3	15	53	9	23	0
Poverty	1967	84	13	52	32	3	21	17	17	45	0
	1971	72	17	36	36	3	33	24	16	27	0
	1972	82	17	20	62	2	31	26	19	24	0
	1973	77	16	18	59	2	24	28	11	37	0
Oxbow	1967	85	15	68	17	3	26	22	10	42	0
	1971	77	15	63	14	4	36	28	13	23	0
	1972	99	16	52	47	3	26	27	19	28	0
	1973	87	15	38	49	3	17	38	15	30	0
Krassel	1967	94	22	75	19	3	36	13	18	33	0
	1971	102	16	63	39	3	29	25	22	24	0
	1972	99	18	28	71	3	32	23	17	26	0
	1973	92	18	43	49	2	25	22	30	23	0
Secesh	1967	110	29	59	51	2	73	19	1	8	0
	1971	120	30	72	48	3	71	20	2	7	0
	1972	127	33	59	68	3	77	15	2	6	0
	1973	-	-	-	-	-	-	-	-	-	-
Mackay Bar	1967	111	29	68	43	2	59	28	6	7	0
	1971	114	24	77	37	3	78	14	2	6	0
	1972	113	22	67	46	4	83	13	1	3	0
	1973	-	-	-	-	-	-	-	-	-	-

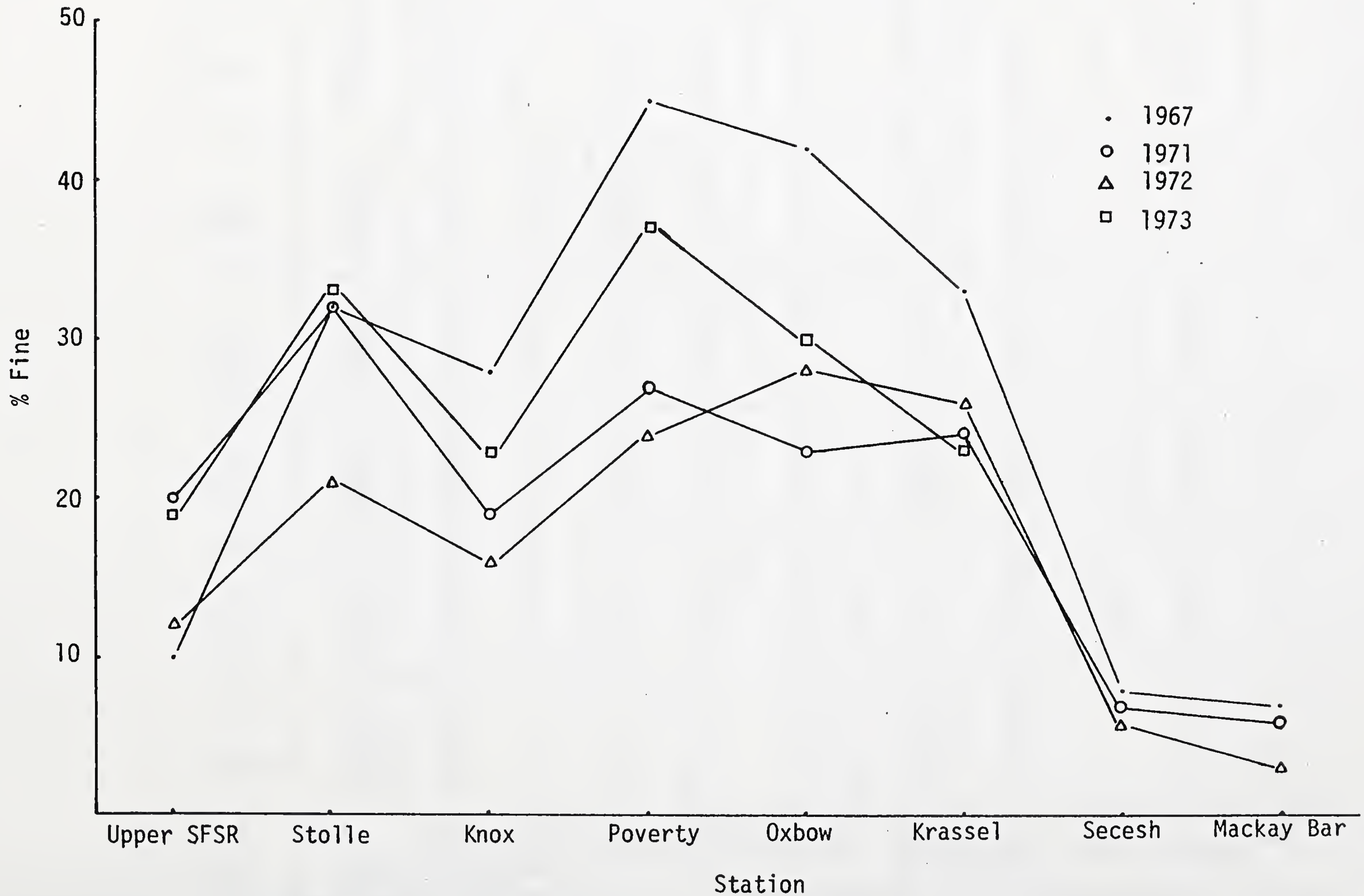

Figure 4. Average fine sediment content of the South Fork Salmon River channel by study area.

Upper SFSR Area

Due to lower than average waterflows, average stream width and depth were lower than in past years. In most river areas, including the Upper SFSR area, there is a definite decrease in riffle area and an increase in pool area. Pool quality is also increasing as pools eliminate fine sediment.

Boulder, gravel, and fine sediment appear to be neither increasing or decreasing, but rubble may be increasing.

Stolle Area

This river area has low energy; changes, if they develop, should be slow. So far, no definite trends have developed and fine sediment appears to be about the same as in 1967. Ocularly, fine sediment appears lower and rubble higher, but more trend information is needed.

Knox Area

The Knox area has much higher energy than the Stolle area. However, boulder material is decreasing and rubble increasing. Fine sediment is showing a downward trend.

Poverty Area

This area covers the major spawning area and was much higher in fine sediment during 1973 than 1972. From 1965 to 1972, fine sediment steadily declined. Possibly the predominance of pool transects (77 percent) has rated fine sediment in 1973 higher than actual. If so, it demonstrates that

the transect intensity is not high enough to give valid readings under abnormal waterflows. As the analysis of future annual information is completed, conditions due to different annual discharge, peak flows, and sediment accruement will become more predictable.

Oxbow Area

The Oxbow area is steadily decreasing in fine sediment and probably increasing in gravel and rubble. This area has gained remarkably in higher quality aquatic environment conditions since 1965.

Krassel Area

During 1973, the Krassel area had excellent cleansing of fine sediment from riffle areas and both the river and monitoring stations showed a definite decrease in fine sediment. Many of the pools in this area, however, filled with fine sediment during 1973.

Secesh-Mackay Bar Area

Channel materials in these areas, due to high competency, are stable as far as fine sediment content, and transects will only be read each fifth year. Due to high energy, fine sediment is not allowed containment in the channel over the 10 percent level.

DISCUSSION

The 1973 monitor information lends support to river condition predictions and projections stated in previous progress reports. The monitoring stations show spawning areas are following developed trends in reduction of fine sediment. Although the river stations in 1973 showed an increase in fine sediment over 1972, it could be due to a mix of factors such as abnormal waterflows.

The 1974 winter floods in combination with what may be the highest snowpack on record could have an effect on predicted trends. It appears some lands in the lower elevations (below 4,800 feet) contributed high amounts of accelerated sediment to the river. It will be interesting to see how the river responds from a back-to-back year of what may have been a hundred year low in water discharge and a hundred year high in water discharge. It also puts the test to our methodology to determine its adequacy under these abnormal conditions.

CONCLUSIONS

1. The SFSR is continuing to follow the trend toward equilibrating with a healing watershed.

RECOMMENDATIONS

1. Because of the 1974 floods and record snowpacks, the aquatic environment-fisheries studies should monitor their effects and continue to follow the river's return.

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